y_{ci} = the vertical distance between the centroid of each pixel and the upper edge of the image, in

$$= \frac{1}{yres}(y_i - .5) \tag{3}$$

y_c = the vertical distance between the upper edge of the image and the centroid for the aggregate shape, in

$$= \frac{\sum_{i=1}^{n} A_i y_{ci}}{\sum_{i=1}^{n} A_i} \tag{4}$$

$$= \frac{A\sum_{i=1}^{n} y_{ci}}{nA} \tag{5}$$

$$= \frac{1}{n}\sum_{i=1}^{n} y_{ci} \tag{6}$$

$$= \frac{1}{n \cdot yres}\sum_{i=1}^{n}(y_i - .5) \tag{7}$$

d_{yi} = the vertical distance between the centroid of each pixel and the centroid of the aggregate shape, in

$$= y_{ci} - y_c \tag{8}$$

$I_{cx'}$ = the centroidal moment of inertia of the aggregate shape about its x axis, in^4

$$= \sum_{i=1}^{n}\left(I_{cx}{}'^{\,i} + A_i d_{y_i}{}^2\right) \tag{9}$$

$$= \sum_{i=1}^{n} I_{cx}{}'^{\,i} + A\sum_{i=1}^{n} d_{y_i}{}^2 \tag{10}$$

$$= nI_{cx}{}'^{\,i} + \frac{A}{yres^2}\sum_{i=1}^{n}\left(y_i - .5 - \frac{1}{n}\sum_{i=1}^{n}(y_i - .5)\right)^2 \tag{11}$$

array is created where n is the number of preferred-color pixels. However the data is arranged, standard engineering formulas adapted for use with the arrangement are then used to develop the section properties.

EXAMPLE

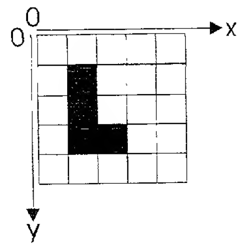

Figure 1 An example digital image with each square representing a single pixel, white signifying empty space and black as the preferred color

X	Y
2	2
2	3
2	4
3	4

Figure 2 The corresponding array

The standard engineering formulations adapted to the array:

A = area of each pixel, in^2

$$= \left(\frac{1}{xres}\right)\left(\frac{1}{yres}\right) \qquad \textbf{(1)}$$

where xres and yres are the resolution of the digital image in pixels/inch

I_{cx}^{1} = the centroidal moment of inertia for each pixel about its x axis, in^4

$$= \frac{\left(\frac{1}{xres}\right)\left(\frac{1}{yres}\right)^3}{12} \qquad \textbf{(2)}$$